

ABSTRACT

Eastern Africa tea is grown in high rainfall areas causing high nutrients depletion through leaching and surface run-off. Nutrients are also removed with harvested crop. The depletion requires nutrients replenishment through fertilizer applications. But inappropriate nitrogen rates cause nutrients imbalance, reduce soil pH, and influence soil organic carbon contents. Plucking intervals cause variations in tea productivity. Despite environmental factors vary in Eastern Africa, recommended fertilizer formulation, NPKS, 25:5:5:5, rates and harvesting intervals are similar in all regions. It is not documented if the NPKS fertilizer rates and plucking intervals influence soil chemical parameters within Eastern Africa tea growing regions. This study determined effects of NPKS 25:5:5:5 as fertilizer rates and plucking intervals on soil organic carbon, pH, and nutrients levels and the relationship between soil organic carbon, pH, nutrients levels and tea yields in Eastern Africa. Soil samples were collected from fertilizer trials on clone TRFK 6/8 at Timbilil, Changoi, Arroket (Kenya), Maruku, Katoke (Tanzania), Kitabi and Mulindi (Rwanda), trials were laid out as 5x3 factorial with five nitrogen fertilizer rates (0, 75, 150, 225 and 300KgN/ha/year) and three plucking intervals (7, 14 and 21 days) as treatments at each site. Soil samples were obtained at depths of 0-10, 10-20, 20-30, 40-60 cm. Soil organic carbon (SOC) was determined using colorimetric methods; pH using pH meter; nitrogen by Kjeldhal method and the other nutrients using ICPAES. Yields were obtained from the field trials. Soil organic carbon contents ranged from 4.16 to 17.61% and were sufficient. Increasing nitrogen rates increased ($p \leq 0.05$) soil organic carbon, N, P, Al, Mn, Fe, Cu levels but lowered ($p \leq 0.05$) soil pH, K, Ca, Mg, and Zn. The soil pH values ranged between 3.22 and 4.84 and were in optimal range. There was decrease in soil pH with nitrogen application rates suggesting that long term application could increase soil acidity to levels detrimental for tea production. It is necessary to periodically monitor soil pH to invoke mitigation activities if the pH levels decrease below 4.0. Plucking intervals had no influence on SOC, pH and nutrients levels at all sites. Soil organic carbon, pH, and nutrients levels varied significantly ($p \leq 0.05$) from location to location. However, levels were optimal for most of the parameters and therefore were not constraining tea production. Soil organic carbon directly correlated ($p \leq 0.05$) with yields, N, P, Al, Fe, Cu, and Mn and inversely with pH, K, Ca, Mg, and Zn. The correlation between SOC, the nutrients and yields suggest that tea production management must ensure these parameters are optimal for realization of high yields.